

AMPHIBIA: CAUDATA: PLETHODONTIDAE

DESMOGNATHUS BRIMLEYORUM

Catalogue of American Amphibians and Reptiles.

Means, D. Bruce. 1999. *Desmognathus brimleyorum*.

***Desmognathus brimleyorum* Stejneger**
Ouachita Dusky Salamander

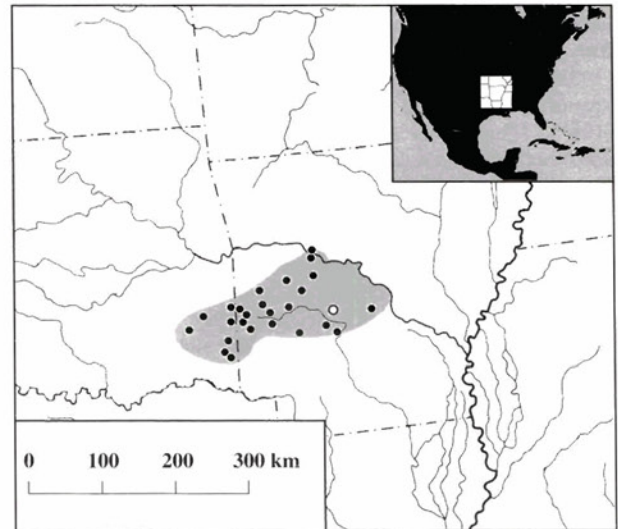
Desmognathus brimleyorum Stejneger 1894:597. Type locality, "Hot Springs, Ark[ansas]." Holotype U.S. National Museum (USNM) 22157, a juvenile female, 74 mm TL, collected by B.L. Combs (Strecker 1908) and donated by Messrs. H.H. and C.S. Brimley, October 1894 (examined by author); paratypes USNM 22158–22169 (examined by author), same collection data as holotype and MCZ 2598, 119776 (previously USNM 22170–1), same collection data as holotype except that the date was not dittoed in the USNM catalog (not examined by author).

Desmognathus fuscus brimleyorum Dunn 1926:101.

• **CONTENT.** No subspecies have been described.

• **DEFINITION.** *Desmognathus brimleyorum* is a large (second largest in the genus), robust, keel-tailed, semi-aquatic, mountain brook-inhabiting desmognathine salamander with an aquatic larval stage. Pronounced variation in body size exists among the different mountain masses inhabited by the species, and between the sexes. Mean (± 1 SD) SVL (to posterior angle of vent) for 249 males (with two testis lobes or greater) from three major mountain groups of the Ouachita Mountains, Rich, Kiamichi, and the Cossatot, combined, is 77.04 ± 9.40 mm (53–98 mm), and for 150 gravid females from the same three mountain groups 69.76 ± 6.65 mm (54–83 mm) (Means 1975). Adults measure 70–180 mm TL (Petranka 1998). Maximum length occurs in populations on Rich Mountain at 98.0 mm SVL for males and 83.0 mm SVL for females (Means 1975). In the Cossatot Mountains and in the eastern half of the range, *D. brimleyorum* populations average smaller, 71.0 mm SVL and 64.0 mm SVL, for adult males and females, respectively. These differences are mirrored in body weights (Means 1975). The typical desmognathine cheek patch, a lightly pigmented rectangular area bordered above and below by thin, dark lines, runs from the posterior corner of the eye to the posterior corner of the mouth in juveniles and small adults. Metamorphosed individuals have 14 costal grooves (Petranka 1998).

• **DIAGNOSIS.** Older adult *Desmognathus brimleyorum* from Rich, Kiamichi, Winding Stair, and Fourche mountains can be distinguished by their large size and uniform dark brown color dorsally and ventrally. On other mountain masses (Cossatot, Potato Hills), adults may be faintly spotted or patterned on the



MAP. Distribution of *Desmognathus brimleyorum*. The circle marks the type locality and dots indicate other records.

dorsum. Juveniles have 5–6 pairs of light dorsal spots surrounded by broken rings of dark pigment; these pattern elements fade with age (Means 1974). External gills of larval *D. brimleyorum* approach the luxuriant larval gills of *D. auriculatus*, but larvae can be separated from those of *D. auriculatus* by the higher number of pale spots (11–14 in the former versus 7–9 in the latter, Valentine 1963). Adults are larger and possess a shorter tail in relation to body length, a less brightly marked dorsum, and prominent white spots on the sides of the tail in comparison with *D. fuscus conanti* (Rossman 1958). Metamorphosed individuals of *D. brimleyorum* are distinguished from all other members of the subfamily Desmognathinae by the fungiform morphology of all the teeth on both jaws (Means 1974).

• **DESCRIPTIONS.** The type series from Hot Springs was described and compared with congeners by Stejneger (1894). Strecker (1908) described juveniles and adults, also from Hot Springs. Dunn (1917, 1926) described individuals from Hot Springs and Little Rock. Bishop (1943) gave a full description of larvae, juveniles, and adults from Rich Mountain, Oklahoma. Chaney (1958) described populations from Russellville, Arkansas and compared them with populations of *Desmognathus* species in Louisiana (see Comments). For populations throughout the Ouachita Mountains, Means (1974) described teeth, jaw profile, tail, prearticular spine morphology, interpopulational body size, color pattern, and the ontogenetic fate of larval neuromast



FIGURE. Adult male (above) and female *Desmognathus brimleyorum* from Rich Mountain, Polk Co., Arkansas (photograph by author).

organs as influencing adult pigmentation. Petranks (1998) described juveniles and adults based on the literature. Larvae can be identified by the use of a dichotomous key in Altig and Ireland (1984), and allometric growth in larvae was described by Rubenstein (1971). Cloacal anatomy was described by Sever (1983) and Sever and Trauth (1990). Post-oviposition morphology of spermathecae and ovaries were described in Trauth (1988). Morphology of sperm was compared with congeners and other plethodontids in Wortham et al. (1977). Morphometric and color pattern comparisons with congeners were made in Smith (1960).

• **ILLUSTRATIONS.** Images of this species are poorly represented in the literature. Color photographs are in Behler and King (1979) and Black and Sievert (1989). Black and white photographs are in Bishop (1943, two adult males), Means (1974, two larvae, six juveniles, and a sexually mature male and female from Rich Mountain), Trauth (1988, egg clutches and a nesting site), and Petranks (1998, a uniformly patterned adult from Oklahoma, a patterned adult from Arkansas, and an Oklahoma larva). A drawing of an adult is in Conant and Collins (1998). A camera lucida drawing of a cleared and stained larval skull is in Rubenstein (1971). Line drawings of the skull and the lateral aspect of the head, and scanning electron microscope photographs of teeth are in Means (1974).

• **DISTRIBUTION.** *Desmognathus brimleyorum* is found mainly in highland areas south of the Arkansas River. The range includes Petit Jean Mountain and the Ouachita Mountains of western Arkansas and eastern Oklahoma, but the species is known principally on the following: Rich, Winding Stair, Black Fork, Kiamichi, Fourche, Magazine, and Cossatot mountains. Petit Jean Mountain is an erosional feature in Arkansas, not a part of the Ouachita Mountains. These salamanders are also found in small streams in the rugged topography south to Beaver Bend State Park in McCurtain County, Oklahoma and south and east of Little Rock. The species does not appear to reach Iron Fork Mountain at the western limit of the Ouachita Mountains in Oklahoma, with the westernmost known populations in the Potato Hills of Oklahoma (Means 1974, Karlin and Guttman 1986). Except for three questionable localities mentioned by Dowling (1957), Chaney (1958) reported the only population known north of the Arkansas River at Russellville. Other distributional information is found in Ortenburger (1929), Burt (1935), Dowling (1957), Means (1974), and Bacon and Anderson (1976).

• **FOSSIL RECORD.** None.

• **PERTINENT LITERATURE.** Egg clutches, embryos, and nest microhabitats were described by Trauth (1988). Growth from hatching, age at sexual maturity for both sexes, egg clutches, and number of eggs per clutch in populations near Russellville, Arkansas, were described by Chaney (1958). Gravid females from the top of Rich Mountain were reported by Hilton (1948). Strecker (1908) quoted notes of Combs regarding habitat, egg-laying, and female brooding behavior. Strecker's (1908) quote of Combs, "During a dry spell she [the brooding female] will carry them [eggs] down into her hole with her, and if it rains again before they are hatched, will again bring them to the surface," appears to be a conclusion statement and needs verification. Means (1975) reported season of oviposition, synchrony of oviposition among mountain populations, season of hatching, and season of transformation. Aspects of interpopulational body size variation (sexual size dimorphism, adult body size, relative growth in males and juveniles, hatchling and transformling size) were analyzed by Means (1975). Age

at maturity in both sexes, reproductive periodicity of females, adult longevity, and growth rates for both sexes were also reported in Means (1975). Taylor et al. (1990) reported ovarian mass, gonosomatic index, ovarian clutch size, clutches observed in the field, and concluded the species has an annual oogenic cycle. Trauth et al. (1990) reported seasonal distribution of yolked ovarian follicles, ovarian clutch size, average ovum diameters, season of oviposition, and regressed ovarian clutch size against SVL. Population density and microhabitat structure were reported by Means (1975). Courtship behavior was described by Verrell (1997).

Food items in the alimentary canal and cannibalism on larvae were reported by Chaney (1958). Hurter and Strecker (1909) reported feeding on *Spelerpes* (= *Eurycea*) *multiplicata* in the collecting bucket after capture. Larvae were observed feeding on aquatic isopods in pools of water in mines (Heath et al. 1986). Vertebrate habitat associates were reported in Strecker (1908). Bishop (1943) and Means (1975) described the habitat, and microhabitat selection was described in Means (1975).

Snake predators were reported by Gloyd and Conant (1990) and Trauth and McAllister (1995). Loomis (1956), Means (1974), Anthony et al. (1994), and McAllister et al. (1995) reported that the skin of individuals is sometimes infested with trombiculid mites (*Hannemania* sp.), causing loss or fusion of toes and bumpy skin. Winter et al. (1986) gave information on cestode and nematode symbionts. McAllister et al. (1995) found intraerythrocytic inclusions in *D. brimleyorum* from Kiamichi Mountain and protozoan, trematode, cestode, and acanthocephalan parasites in animals from Rich Mountain.

Reactions by white mice subjected to injection of crude skin extracts of *D. brimleyorum* were reported by Brandon and Huheey (1985). Dean (1959) used tail muscle amino acids subjected to paper chromatography to infer phylogenetic relationships within the subfamily Desmognathinae. Hinderstein (1971) reported on muscle lactate dehydrogenase isozymes. Karlin (1978) and Karlin and Guttman (1986) analyzed allelic variation in proteins from internal organs by starch gel electrophoresis, from which they based conclusions about phylogeny and genetic divergence times of *D. brimleyorum* among congeners. Karlin et al. (1993) used an allozyme survey of 19 presumptive protein loci to base conclusions about the genetic population structure of *D. brimleyorum* among six major mountain masses in the Ouachita Mountains. Titus and Larson (1996) hypothesized phylogenetic relationships of *D. brimleyorum* in Desmognathinae using mitochondrial DNA sequences encoding 12S and 16S ribosomal RNA, morphological, and reproductive characters. The monetary value of individuals was given by the SSAR Monetary Value of Amphibians Subcommittee (1989).

• **ETYMOLOGY.** *Desmognathus brimleyorum* was named for the brothers, H.H. and C.S. Brimley, naturalists active in the southeastern U.S. from 1880–1946 (Cooper 1979). The common name currently in use is Ouachita Dusky Salamander (Collins 1997). Other common names that have been used in the literature are Brimley's Triton (Strecker 1908), Brimley's Salamander (Bishop 1943), Brimley's Dusky Salamander (Schmidt 1953), and Central Dusky Salamander (Cochran and Goin 1970).

• **COMMENT.** Dunn (1926) considered *brimleyorum* a subspecies of *D. fuscus* (Green) and was the first to apply the name, *D. f. brimleyorum*, to Texas populations. Thereafter followed a period of about 40 years when workers assigned the name *D. f. brimleyorum* to populations of other species throughout the Coastal Plain from Texas to Virginia (Burt 1938; Bishop 1943; Sanders and Smith 1949; Burger et al. 1949; Chaney 1949, 1958;

Brown 1950; Grobman 1950; Livezey 1950; Schmidt 1953; Neill 1957; Carr and Goin 1959; Dial 1965). Valentine (1963), discussing habitat preferences and geography, Means (1974), discussing body size and fungiform tooth morphology, and Cook and Brown (1974), studying Texas salamanders, explained why the name *brimleyorum* should be restricted to populations from the Ouachita Mountains. All subsequent researchers have considered *D. brimleyorum* to be a distinct species found mainly in the Ouachita Mountains of Arkansas and Oklahoma and the relieved topography south of the Ouachitas along the Oklahoma/Arkansas border.

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